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A SEARCH FOR LIGUUS.

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For a considerable time in the past I have been making annual trips to the Florida Keys for the purpose of studying the life of the region, its geographical distribution and the geology. Sometimes I have gone by boat but oftener by train, running to the most southern point visited and tramping back. I formerly went alone carrying no load and like an invading army trusting for sustenance on the territory I visited; but I have been so regularly taken for a tramp or bad man and driven from the doors of the natives, that of late I carry a small tent, bedding, provision, even drinking water, and by that means I am independent and can camp whenever and wherever night overtakes me.

Several islands of the lower chain have a considerable growth of the Carribean pine (Pinus caribaea), found generally in the southernmost part of the State. Big Pine Key is pretty well clothed with this kind of forest; and it is found on No Name, Little Pine, Cudjoe and several other keys.

Big Pine is a sort of headquarters from which I make trips to nearby islands. It is the largest of the lower keys, being over eight miles in length and about two and a half in width at its widest part. It runs from north northwest to south southeast and in shape reminds one somewhat of one of the modern Ku

Klux clothed in full regalia, its robe flowing irregularly down its body and ending above in a comical, twisted headgear. There are two projections on its eastern side, the southernmost being a considerable island at high tide but connected when the water is low, and the whole is called "Doctor's harm" (arm). A long strip of swamp stretches southward from its southeast corner which suddenly turns to the westward and the projection is called "The helbow." All the island except the long strip on the south is oolitic limestone, the latter part being an old coral reef and a part of the upper chain which ends with the nearby Newfound Harbor Keys.

One who visits the islands for the purpose of collecting tree snails may be said to almost be "between the devil and the deep sea." It is probable that not more than 35 inches of rain fall yearly on a considerable area of the Lower Keys, and the greater part of this comes in the warmer season. During the drier part of the year what few arboreal snails still remain on the keys hide away in holes or crevices of the trees or even deep under rocks so that it is well nigh impossible to find them. This is the period which is supposed to be free from mosquitos and the only one during which a collector can have any comfort. During the warm season when most of the rain falls the keys are generally an inferno caused by these insects. Sand flies are in order at all times of the year. I generally go the latter part of October, hoping to find the mosquitos departing and the snails still somewhat active, and come back early in November.

On a recent visit to the keys I stopped as usual on Big Pine and made my way back on the railroad to the "helbow" where a noble piece of hammock, covering perhaps forty acres or more, once stood. Part of it was long ago cleared and planted but later abandoned. Charcoal burners have cut the best of the timber for their business and hurricanes have wrought great destruction in it, as it is in a badly exposed locality.

Between the railroad embankment and the hammock a tideway, about twenty feet wide and three feet deep, drained the great swamp into the open sea. I would either have to wade it and get my clothes wet or take off trowsers, shoes and leggins

and on my return go through the same operation. I set my wits to work to contrive a bridge from the timbers which were thickly scattered about by a former hurricane. I laid a track of plank, got a piece of an oar and a broken gaff out of which I made a couple of rollers. Then I strained and lifted onto these a twenty-foot timber, six by twelve, which had done duty in some old railroad bridge, and rolled it down into the water. I shoved the far end of it into a little cove on the opposite side, staked the near end to keep it from drifting away and triumphantly walked across it, saying to myself, "When a man uses his brains he can save himself a lot of discomfort." In front of me grew perhaps a half acre of saltwort (Batis maritima), a dense, half-erect shrub with very succulent leaves, and I strode through this on my way to the sandy shore beyond. Suddenly I bogged down, going over my knees into water and mud that the deceptive shrub had entirely concealed, and after floundering across a couple of rods of this loblolly I crawled out on the opposite side completely bedraggled and disgusted. I reached the sandy shore and a little farther on the hammock. This piece of forest is doubtless classic ground. In the first half of the nineteenth century there lived in Key West a Dr. John Blodgett, who practiced medicine and carried on a drug store. He became greatly interested in the botany of the keys and made collecting trips among them. He discovered two Clusias, tropical strangling trees, and a Cupania, a member of the soapberry family on Big Pine, and as this hammock was very accessible to any one coming from Key West he no doubt collected in it and in all probability discovered these trees in it. I have searched the forests of Big Pine, and Dr. John K. Small of the New York Botanical Garden has done likewise, but no vestige of any of them has been found, and they are probably extinct so far as our flora is concerned. Henry Hemphill, perhaps the best conchological collector of his time, worked, I believe, on this key (perhaps in this hammock) and the adjoining No Name and found beautiful Liguus solidus in variety.

Without a doubt these snails have lived in this hammock until lately, perhaps until the dreadfully disastrous hurricane of September, 1919. I visited it a couple of months later and

found many dead and broken Liguus along the shore in front of it, some of them still well colored, probably washed out by the exceedingly high tide which covered much of the floor of the forest with sand and debris. At the time of my last visit I spent the better part of a day carefully combing it over in the hope of finding this snail alive, but in vain. My search only brought to light a few dead, faded shells inhabited by hermit crabs.

This hammock although nearly ruined seems to be headquarters for cacti on the Lower Keys. Chapman's "Flora of the Southeastern States" only gives six species, two of which are introduced, for the entire region covered by his book, but Dr. Small lists no less than eight natives from this hammock alone. Among them is a tall, columnar Cereus with trunks as large as a man's body and twenty feet high, and another more slender but erect form which I discovered on Lower Matecumbe Key several years ago. One of the prickly pears (Opuntia) is nearly prostate and has joints about the size and shape of an old-fashioned hunting-case watch—a most striking form. In fact whatever time and attention one is not compelled, when in this hammock, to give to fighting mosquitos and sand flies, must be devoted to crawling through and avoiding cacti.

A few days later I was joined by my friend Dr. Edward Mercer, formerly of Philadelphia but now of Miami, who has been with me on several recent trips. In the village of Big Pine I was told of a man, who, not long before, had found *Liguus solidus* in variety on the northeastern part of the island where he had gathered a quantity and could have taken a "hatful." That has become a stereotyped word, and every time I visit the Lower Keys I am told of some one who could have filled his hat with them. And when traced down it turns out that he has perhaps gotten a few Oxystyla, which still sparingly persists on some of these islands, or *Drymaeus multilineatus*, a very abundant but much smaller form. In some cases the bona fide sworn-to Liguus turns out to be *Litorina angulifera*. I have come to believe that the spot where *Liguus solidus* is abundant is either at the end of the rainbow or where you pick up the will-o-the-wisp. One man volunteered for a

consideration to guide us to the exact hammock where these snails had been found, but when we had arrived at a couple of tumbledown houses in the northern part of the island he didn't know just where it was, but swept his hand around the horizon in a vague way and said the hammock was "off yonder." We found nothing, not even a bone.

We determined to tramp across the island and make an attempt to find Watson's Hammock which lay on the opposite shore. We had been told that we would find the walking fairly good and were given the general direction. In two minutes we ran into a buttonwood swamp which I have since learned covers the greater part of the interior of the island. This is not the buttonwood or sycamore of the northern states, or any kin to it, but a tropical tree with dark, greenish, very combustible wood which inhabits brackish swamps or their immediate vicinity. It is a strange tree, having many forms, sometimes erect with a height of 70 feet and a trunk diameter of two feet; again it falls over and becomes a gigantic, writhing half-vine. On drier ground it is a small, somewhat erect tree, and in this swamp it grew in this fashion, only it threw out a good many stiff, crooked branches just at the ground which admirably served to trip our tired feet. It was only a short time until we came to more or less extensive pools and ponds of beer-colored, brackish water, which we tried for awhile to avoid by making a circuitous tramp around them. Soon, however, it became apparent that we must wade, and we plunged in, often to the depth of three feet, blundering and even falling over the very irregular bottom. Then for a long distance we encountered stands of buttonwood, dense scrub hammock and water. This hammock was, without exception, the most difficult to get through I ever saw. A considerable part of it consisted of a small tree or large shrub, a Bumelia or ant's wood, with narrow leaves and innumerable branches. The whole purpose of the tree seemed to be to develop and carry an immense load of long, excessively sharp thorns which for their ability to catch hold and hang on cannot be surpassed anywhere. It formed thickets, not quite as dense as a haystack, but the next thing to it, and we could no more crawl through it than we could through the side of a battleship.

This growth which belongs in slightly brackish ground bordered the hammocks and we had to get through it in some way to get across the latter. Often we got into a pocket and after fighting our way along for a while we were obliged to turn back and get out the way we came in. At other times I got down and cut my way through with my pocket knife so that we could push our bags ahead and crawl after. In the real dry hammocks the Bumelia was replaced by the pull-and-haul-back (Pisonia aculeata), and a tropical prickly ash (Zanthoxylum), to such an extent that they were nearly impassable. Wherever we found hammock I strained my eyes to find Liguus but saw none.

There was only the ordinary development of sand flies and common gray mosquitos, but we had scarcely gotten into the swamp before we began to encounter swarms, or herds, or droves, whichever they might best be called, of an enormous black mosquito, the largest and most terrifying I have ever seen. They shone as if freshly varnished and came on with a steady, leisurely flight as if they were sure of their victims. The fore part of these monsters bent down in a remarkable way, probably to allow the proboscis to get into action for some time before the rest of the insect arrived. The doctor at once called them "Dirigibles" which we soon shortened to "Blimps" on account of the inconvenience of using a word of four syllables whenever we encountered them. When one of these became filled with blood and slowly sailed away with its various appendages trailing below and after, it suggested a zeppelin in a remarkable manner.

For five dreadful hours we fought our way through this inferno. Often the growth was so dense that we could not see the sun and we constantly consulted our pocket compasses and bore off to the west or northwest whenever it was possible. Sometime before sundown I saw an open spot in front, then I caught a glimpse of the sea and a date palm which some one had long ago planted near the shore. In a moment we stepped out onto a level, smooth, grass-covered prairie that stretched to the Torch Key Channel, and we swung our hats and capered about like boys. Taken all in all, I believe this was about the most difficult short tramp I ever made, and when we got near the shore I was glad to throw myself down on the grass and rest.

The doctor is a delicate man of 60 whose health is none the best, and when he first proposed to go tramping with me I felt very doubtful whether he would be able to endure the hardships of such a rough-and-tumble life. Instead of lying down and resting that evening he took a long walk through the pine woods apparently for mere relaxation. In our various excursions I found him always ready to lead, and he never gave any intimation that he felt the slightest fatigue.

We pitched our tent on a growth of sedges (Eleocharis), so dense and tall that we could walk on it without pressing it to the ground—an admirable bed. Then we crawled in and after driving out the mosquitos carefully closed, as we thought, every aperture and congratulated ourselves on the prospect of a fine sleep. I did sleep but uneasily and was vaguely conscious that the doctor was much disturbed. When daylight came we could see that the inside of the walls and roof of the tent were so covered with mosquitos gorged with our blood that in places one could not have put his finger on them without touching an insect. We discovered a minute opening, just large enough to admit them in single file, and they had been industriously passing in all night.

We searched some small hammocks which lay to the northwest of us without results and then turned southward along the shore, finally reaching the great Watson's Hammock. Formerly this covered a considerable area and consisted of a magnificent growth of tall, closely-set tropical trees. Much of it has been cut out; but there still remains a splendid remnant, and this we diligently searched but found only a few faded bones. I first visited this forest in 1885, arriving just before sundown. My boatman who was anxious to get on only consented to allowing me a few minutes on shore, but during that brief time I could see that the trees were full of splendid Liguus. Had I been allowed a little time I could have actually gotten "a hatful." As it was I found the type of my *Liguus solidus crassus*, a form with a very solid shell and truncate columella, ivory white with a narrow bronze-green peripheral line, also a couple of specimens of the form *graphicus*.

We struck off down the island in a general southeast direc-

tion, but in trying to avoid the swamps were obliged to zigzag about considerably. The walking on the lower islands is much better than that of the upper ones, the general surface being level and comparatively smooth. This is an oolitic limestone much like that of the Miami region, but it was deposited in a shallow sea while the latter formed a retreating shore and is irregularly stratified. In many places the rock of the Lower Keys has split loose in thin layers and become broken up, and between the pine trees there is often a dense growth of a palmetto (Thrinax microcarpa). The whole is generally tied together with a villainous climbing smilax which is most liberally provided with thorns.

After a long tramp we reached the village, and the next morning had my old friend Joseph Sears take us across the strait to No Name Key. Sears is a powerful Bahama negro, good-natured and voluble, and in time past he has taken me to many of the keys in his boat, the "Three Fannies."

We camped in the front yard of an abandoned place, again getting a bed of the Eleocharis, and this time were fortunate enough to entirely shut out the mosquitos, but we could hear their angry humming all night, music which lulled us to sleep. No Name is nearly three miles long and about a mile wide, its northern part being pine forest with a dense undergrowth of palmettos. There is, or has been, a great central hammock of magnificent tall, closely-set tropical trees, but about 60 acres of it have been cut out. Much of the southern part of the island has been hammock but most of it is now destroyed. We carefully searched this interior forest, almost tree by tree, but found no living Liguus. In places the ground was thickly strewn with broken and bleached shells, some of the fragments still retaining color.

It may be asked, "What has become of them?" Their disappearance is due to several causes, man being the chief. The building of the extension of the Florida East Coast Railway wrought terrible destruction among the hammocks on the keys. One of the finest pieces of this growth was located on Key Largo where sparks from the engines set the timber cleared from the right-of-way on fire and destroyed hundred of acres of splendid

Liguus-bearing forest. There has been a series of years with a deficiency of rainfall, twelve in number according to a well-informed settler on one of the keys, and the snails have been driven to take refuge in crevices of trees and under the rocks while doubtless many have been exterminated. Birds have killed many more. Possibly dry weather has made food scarce and caused the birds to prey to a greater extent on the snails than usual.

I am strongly inclined to believe that a few colonies of the *solidus* may still exist on the Lower Keys. Three years ago I found three adult specimens of the typical form of this on trees back of the village of Big Pine. Several years ago Henderson and Clapp found a large colony of *solidulus* on Stock Island, but at my last visit to this only a few dead shells could be obtained. Within a couple of years I have found several tolerably fresh shells of *graphicus* on No Name, two on Sugarloaf and a fairly good young *solidulus* on Summerland and Boca Chica. There is still a good deal of hammock, some of it second growth according to my friend, J. T. Knowles, of Big Pine Key, on several of the islands, and the fact that settlement is decreasing rather than extending on the lower chain makes it probable that this growth may spread. If we could have a series of wet years it is easily possible that these snails might increase and be abundant again in places. There is no group of land snails on earth with more wonderfully beautiful shells than those of *Liguus solidus*. Their texture is of a marvellously delicate porcelain, their polish is remarkable and the colors of some are bizarre and extremely rich.

NOTE.—The above forms part of a chapter of my forthcoming book entitled "Out of Doors in Florida."